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1 Geiger: monitoring the buffer cache in a virtual machine environment
Stephen T. Jones, Andrea C. Arpaci-Dusseau, Remzi H. Arpaci-Dusseau
October 2006 **ACM SIGOPS Operating Systems Review , ACM SIGARCH Computer Architecture News , ACM SIGPLAN Notices , Proceedings of the 12th international conference on Architectural support for programming languages and operating systems ASPLOS-XII**, Volume 40 , 34 , 41 Issue 5 , 5 , 11
Publisher: ACM Press
Full text available: pdf(326.97 KB) Additional Information: full citation, abstract, references, index terms

Virtualization is increasingly being used to address server management and administration issues like flexible resource allocation, service isolation and workload migration. In a virtualized environment, the virtual machine monitor (VMM) is the primary resource manager and is an attractive target for implementing system features like scheduling, caching, and monitoring. However, the lackof runtime information within the VMM about guest operating systems, sometimes called the semantic gap, is a s ...

Keywords: inference, virtual machine

2 Applications & security policy: A novel approach for a file-system integrity monitor tool of Xen virtual machine
Nguyen Anh Quynh, Yoshiyasu Takefuji
March 2007 **Proceedings of the 2nd ACM symposium on Information, computer and communications security ASIACCS '07**
Publisher: ACM Press
Full text available: pdf(253.86 KB) Additional Information: full citation, abstract, references, index terms

File-system integrity tools (FIT) are commonly deployed host-based intrusion detections (HIDS) tool to detect unauthorized file-system changes. While FIT are widely used, this kind of HIDS has many drawbacks: the intrusion detection is not done in real-time manner, which might render the whole scheme useless if the attacker can somehow take over the system with privileged access in the time between. The administrator also has a lot of problems to keep the base-line database updating. Besides, th ...

Keywords: Linux, Xen virtual machine, intrusion detection, rootkit

3 OS Debugging Method Using a Lightweight Virtual Machine Monitor
Tadashi Takeuchi
March 2005 **Proceedings of the conference on Design, Automation and Test in Europe - Volume 2 DATE '05**

Publisher: IEEE Computer Society

Full text available: pdf(85.92 KB) Additional Information: full citation, abstract, index terms

Demands for implementing original OSs that can achieve high I/O performance on PC/AT compatible hardware have recently been increasing, but conventional OS debugging environments have not been able to simultaneously assure their stability, be easily customized to new OSs and new I/O devices, and assure efficient execution of I/O operations. We therefore developed a novel OS debugging method using a lightweight virtual machine. We evaluated this debugging method experimentally and confirmed that ...

4 An implementation scheme for a virtual machine monitor to be realized on user - microprogrammable minicomputers

B. D. Shriver, J. W. Anderson, L. J. Waguespack, D. M. Hyams, R. A. Bombet

October 1976 **Proceedings of the annual conference ACM 76**

Publisher: ACM Press

Full text available: pdf(654.60 KB) Additional Information: full citation, abstract, references, citings, index terms

A virtual machine monitor allows several different operating systems to run concurrently on the same machine. This paper presents the description of a virtual machine monitor and its support structure which can be implemented on a microprogrammable minicomputer or a distributed network of such machines. In our approach, all storage, transformational, input, and output resources of the system are accessed through a mapping mechanism. The design and implementation methodology for an actual re ...

5 Work in progress session: A virtual machine monitor for utilizing non-dedicated clusters

Kenji Kaneda, Yoshihiro Oyama, Akinori Yonezawa

October 2005 **Proceedings of the twentieth ACM symposium on Operating systems principles SOSP '05**

Publisher: ACM Press

Full text available: pdf(383.72 KB) Additional Information: full citation, abstract, references, index terms

We have designed and implemented a virtual machine monitor (VMM) for utilizing non-dedicated clusters. The VMM virtualizes a shared-memory multi-processor machine on a commodity cluster. In addition, it hides dynamic changes of physical hardware configurations. The experimental result demonstrates the feasibility of our approach.

Keywords: distributed systems, single system image, virtual machine monitors

6 Devirtualizable virtual machines enabling general, single-node, online maintenance

David E. Lowell, Yasushi Saito, Eileen J. Samberg

October 2004 **ACM SIGARCH Computer Architecture News , ACM SIGOPS Operating Systems Review , ACM SIGPLAN Notices , Proceedings of the 11th international conference on Architectural support for programming languages and operating systems ASPLOS-XI**, Volume 32 , 38 , 39 Issue 5 , 5 , 11

Publisher: ACM Press

Full text available: pdf(174.01 KB) Additional Information: full citation, abstract, references, citings, index terms

Maintenance is the dominant source of downtime at high availability sites. Unfortunately, the dominant mechanism for reducing this downtime, cluster rolling upgrade, has two shortcomings that have prevented its broad acceptance. First, cluster-style maintenance over many nodes is typically performed a few nodes at a time, mak-ing maintenance slow and often impractical. Second, cluster-style maintenance does not work on single-node systems, despite the fact that their unavailability during mainte ...

Keywords: availability, online maintenance, planned downtime, virtual machines

7 VM/4: ACOS-4 virtual machine architecture

S. Nanba, N. Ohno, H. Kubo, H. Morisue, T. Ohshima, H. Yamagishi

June 1985 **ACM SIGARCH Computer Architecture News , Proceedings of the 12th annual international symposium on Computer architecture ISCA '85**, Volume 13 Issue 3

Publisher: IEEE Computer Society Press, ACM Press

Full text available: pdf(767.68 KB) Additional Information: full citation, index terms

8 Scalability, performance, and real-time: Diagnosing performance overheads in the xen virtual machine environment

Aravind Menon, Jose Renato Santos, Yoshio Turner, G. (John) Janakiraman, Willy Zwaenepoel

June 2005 **Proceedings of the 1st ACM/USENIX international conference on Virtual execution environments VEE '05**

Publisher: ACM Press

Full text available: pdf(274.74 KB) Additional Information: full citation, abstract, references, index terms

Virtual Machine (VM) environments (e.g., VMware and Xen) are experiencing a resurgence of interest for diverse uses including server consolidation and shared hosting. An application's performance in a virtual machine environment can differ markedly from its performance in a non-virtualized environment because of interactions with the underlying virtual machine monitor and other virtual machines. However, few tools are currently available to help debug performance problems in virtual machine envi ...

Keywords: performance analysis, statistical profiling, virtual machine monitors

9 An efficient virtual machine implementation

Ronald J. Srodawa, Lee A. Bates

March 1973 **Proceedings of the workshop on virtual computer systems**

Publisher: ACM Press

Full text available: pdf(1.01 MB) Additional Information: full citation, abstract, references, citings, index terms

This paper describes the techniques used to implement an efficient virtual machine facility within MTS for the IBM System/360 Model 67. The goals of the project were to support the IBM Operating System, including the Indexed Sequential Access Method and Teleprocessing capabilities, as a subsystem under MTS with a maximum teleprocessing degradation of 30% for OS/360 programs and complete protection between OS/360 and MTS. The first attempt, using channel program relocation similar to that em ...

10 Terra: a virtual machine-based platform for trusted computing

Tal Garfinkel, Ben Pfaff, Jim Chow, Mendel Rosenblum, Dan Boneh

October 2003 **ACM SIGOPS Operating Systems Review , Proceedings of the nineteenth ACM symposium on Operating systems principles SOSP '03**, Volume 37 Issue 5

Publisher: ACM Press

Full text available: pdf(140.31 KB) Additional Information: full citation, abstract, references, citings, index terms

We present a flexible architecture for trusted computing, called Terra, that allows applications with a wide range of security requirements to run simultaneously on commodity hardware. Applications on Terra enjoy the semantics of running on a separate, dedicated, tamper-resistant hardware platform, while retaining the ability to run side-by-side with normal applications on a general-purpose computing platform. Terra achieves this synthesis by use of a *trusted virtual machine monitor* (TVMM ...

Keywords: VMM, attestation, authentication, trusted computing, virtual machine, virtual

machine monitor

11 Work in progress session: A virtual machine monitor for utilizing non-dedicated clusters

Kenji Kaneda, Yoshihiro Oyama, Akinori Yonezawa

October 2005 **Proceedings of the twentieth ACM symposium on Operating systems principles SOSP '05**

Publisher: ACM Press

Full text available: ppt(621.57 KB) Additional Information: full citation

12 VHM : a Virtual Hardware Monitor

Vittore Casarosa, Carlo Paoli

March 1973 **Proceedings of the workshop on virtual computer systems**

Publisher: ACM Press

Full text available: pdf(558.28 KB) Additional Information: full citation, abstract, citings, index terms

We describe here the features and the implementation of a system that collects information about the activity of the virtual machines generated by CP-67. This system can collect information about CPU usage and I/O activity of the virtual machine without interfering with its operation and without knowing what the system running in the virtual machine is doing. In this sense it behaves like an hardware monitor behaves on a real machine, and hence has been called Virtual Hardware Mo ...

13 Virtual machine-based simulation of distributed computing and network computing

Richard T. Wang, J. C. Browne

September 1981 **ACM SIGMETRICS Performance Evaluation Review , Proceedings of the 1981 ACM SIGMETRICS conference on Measurement and modeling of computer systems SIGMETRICS '81**, Volume 10 Issue 3

Publisher: ACM Press

Full text available: pdf(255.73 KB) Additional Information: full citation, abstract, references, index terms

This paper proposes the use of virtual machine architectures as a means of modeling and analyzing networks and distributed computing systems. The requirements for such modeling and analysis are explored and defined along with an illustrative study of an X.25 link-level protocol performance under normal execution conditions. The virtualizable architecture used in this work is the Data General Nova 3/D.

14 Distrbuted VEEs: HyperSpector: virtual distributed monitoring environments for secure intrusion detection

Kenichi Kourai, Shigeru Chiba

June 2005 **Proceedings of the 1st ACM/USENIX international conference on Virtual execution environments VEE '05**

Publisher: ACM Press

Full text available: pdf(262.72 KB) Additional Information: full citation, abstract, references, index terms

In this paper, a virtual distributed monitoring environment called *HyperSpector* is described that achieves secure intrusion detection in distributed computer systems. While multiple intrusion detection systems (IDSes) can protect a distributed system from attackers, they can increase the number of insecure points in the protected system. HyperSpector overcomes this problem without any additional hardware by using virtualization to isolate each IDS from the servers it monitors. The IDSes a ...

Keywords: distributed IDS, inter-VM monitoring, virtual machine, virtual network

15 Are virtual-machine monitors microkernels done right?

Gernot Heiser, Volkmar Uhlig, Joshua LeVasseur

January 2006 **ACM SIGOPS Operating Systems Review**, Volume 40 Issue 1
Publisher: ACM Press
Full text available: pdf(124.78 KB) Additional Information: full citation, abstract, references, index terms

A paper by Hand *et al.* at the recent HotOS workshop re-examined microkernels and contrasted them to virtual-machine monitors (VMMs). It found that the two kinds of systems share architectural commonalities but also have a number of technical differences which the paper examined. It concluded that VMMs are a special case of microkernels, "microkernels done right".A closer examination of that paper shows that it contains a number of statements which are poorly justified or even refuted by t ...

16 Distrbuted VEEs: The entropia virtual machine for desktop grids
Brad Calder, Andrew A. Chien, Ju Wang, Don Yang
June 2005 **Proceedings of the 1st ACM/USENIX international conference on Virtual execution environments VEE '05**
Publisher: ACM Press
Full text available: pdf(280.20 KB) Additional Information: full citation, abstract, references, citings, index terms

Desktop distributed computing allows companies to exploit the idle cycles on pervasive desktop PC systems to increase the available computing power by orders of magnitude (10x - 1000x). Applications are submitted, distributed, and run on a grid of desktop PCs. Since the applications may be malformed, or malicious, the key challenges for a desktop grid are how to 1) prevent the distributed computing application from unwarranted access or modification of data and files on the desktop PC, 2) contro ...

Keywords: desktop grids, grid computing, virtual machine

17 High performance computing--supercomputing: A case for high performance computing with virtual machines
Wei Huang, Jiuxing Liu, Bulent Abali, Dhabaleswar K. Panda
June 2006 **Proceedings of the 20th annual international conference on Supercomputing ICS '06**
Publisher: ACM Press
Full text available: pdf(431.08 KB) Additional Information: full citation, abstract, references

Virtual machine (VM) technologies are experiencing a resurgence in both industry and research communities. VMs offer many desirable features such as security, ease of management, OS customization, performance isolation, check-pointing, and migration, which can be very beneficial to the performance and the manageablity of high performance computing (HPC) applications. However, very few HPC applications are currently running in a virtualized environment due to the performance overhead of virtuali ...

18 Virtual machines: Scale and performance in the Denali isolation kernel
Andrew Whitaker, Marianne Shaw, Steven D. Gribble
December 2002 **ACM SIGOPS Operating Systems Review**, Volume 36 Issue SI
Publisher: ACM Press
Full text available: pdf(1.91 MB) Additional Information: full citation, abstract, references, citings

This paper describes the Denali isolation kernel, an operating system architecture that safely multiplexes a large number of untrusted Internet services on shared hardware. Denali's goal is to allow new Internet services to be "pushed" into third party infrastructure, relieving Internet service authors from the burden of acquiring and maintaining physical infrastructure. Our isolation kernel exposes a virtual machine abstraction, but unlike conventional virtual machine monitors, Denali does not ...

19 Queue Focus: The Reincarnation of Virtual Machines
Mendel Rosenblum
July 2004 **Queue**, Volume 2 Issue 5

Publisher: ACM Press
Full text available: pdf(853.72 KB) html(24.29 KB) Additional Information: full citation, citings, index terms

20 Scalability, performance, and real-time: Friendly virtual machines: leveraging a feedback-control model for application adaptation
Yuting Zhang, Azer Bestavros, Mina Guirguis, Ibrahim Matta, Richard West
June 2005 **Proceedings of the 1st ACM/USENIX international conference on Virtual execution environments VEE '05**
Publisher: ACM Press
Full text available: pdf(317.34 KB) Additional Information: full citation, abstract, references, index terms

With the increased use of "Virtual Machines" (VMs) as vehicles that isolate applications running on the same host, it is necessary to devise techniques that enable multiple VMs to share underlying resources both fairly and efficiently. To that end, one common approach is to deploy complex resource management techniques in the hosting infrastructure. Alternately, in this paper, we advocate the use of self-adaptation in the VMs themselves based on feedback about resource usage and availability. Co ...

Keywords: feedback Control, friendy virtual machines, resource management

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